

REMARKS

The Office Action of January 21, 2011, and the references cited therein have been carefully considered.

In this Amendment, independent claim 17 has been amended to make it clear that the uniform and even bending along an entire circumferential section of the cylindrical separator is a structural limitation and not a product-by-process limitation and thus must be given weight in the claim.

Reconsideration of the rejection of claims 17 and 18 under 35 U.S.C. 102(b) as being anticipated by or under 35 U.S.C. 103 as being obvious over Yamashita et al is respectfully requested.

The present invention as defined in independent claim 17 is directed to an improved cylindrical separator for a cylindrical battery cell. According to claim 17, the cylindrical separator comprises a cylindrical body constituted by a layered structure of a plurality of wound turns of at least a non-woven sheet material, and a bottom part closing one end of the cylindrical body, with the bottom part being an integral extension of the wound layers of the cylindrical body that is bent or pressed down to provide a curved shape and fused by heat. This basic arrangement is well known and is also found in the Yamashita et al patent. However, according to the present invention as defined in claim 17, the curved shape of the bottom part is formed by a uniform and even bend along an entire circumferential section of the cylindrical body, i.e., the bend is symmetrical with regard to the longitudinal axis of the cylindrical separator body. Moreover, the respective inner and outer surfaces of the curved bottom part are continuous and wrinkle-free and the bottom part has a substantially uniform thickness. These latter characteristics of the separator bottom part, which directly result from the method by which the separator is made according to the present invention wherein, contrary to the method used by Yamashita et al, the bending and shaping takes place while the separator is rotating, are not taught or made obvious by the Yamashita et al patent.

In rejecting claim 17, the Examiner has taken the position that Figs. 5C and 5D of Yamashita et al show the bottom part 22a of the separator formed as an integral extension of the cylindrical body 22 that is shaped to be semi-spherical and thus results in a circumferential section which is uniformly and evenly bent. Additionally, the Examiner has stated that Figs 5D and 7 of Yamashita et al show the final separator product with a wrinkle free continuous inner and outer surfaces and the dotted line in

Fig.5D indicates the substantial uniform thickness of the separator. These conclusions by the Examiner are respectfully traversed.

Initially, it is again pointed out that Fig 5D of Yamashita et al is a schematic illustration only and shows the separator after the steps shown in Figs. 6A to 6C and 7 have been carried out. There is no discussion of the dashed line in Fig. 5D and there is no reason to assume that it represents a uniform thickness as opposed, for example, to simply indicating a multilayer element. Moreover, with regard to the modified Fig. 7 of Yamashita et al found in the Office Action, it is noted that element 27 (on which the circle mentioned by the Examiner is found) is **not** a separator as indicated by the Examiner but rather the tool or pin used to laterally fold the part 22c of the vertically positioned cylindrical separator body 22 down onto the top of the pin 25 in order to begin the formation of the separator bottom. The folded part 22c of the separator is only central depression in the upright cylindrical body 22 as can be seen in Fig. 6B, and the sectional view of Fig. 7 does not show the transition between the laterally bent separator portion 22c to the non bent portion which extends upwardly for the length L2. This transition is a curved line (see Figs. 6B and 6C of Yamashita et al) and when the mold 29 (see Fig. 6C) is pressed downwardly to form the curved bottom portion, it folds the upright portion to the already inwardly bent portion 22c after the withdrawal of the pin 27. The result is that, after the application of the mold 29, the number of layers at the bottom will not be the same around the vertical axis of the separator in that there will be parts of the bottom where more layers will be folded down and parts where there will be a double or triple wrinkle in the separator material. For example, in the region where the portion 22c extends upwardly at the left-hand end, the thickness of the finished separator bottom would be expected to be substantially greater than at the right-hand end of the laterally bent portion 22c after the upwardly extending portion L2 is bent down. Thus, Yamashita et al clearly does not teach a uniform bottom thickness, but rather teaches a method that will inherently produce a non-uniform bottom thickness.

It should also be noted that during application of the pin or tool 27, the structure is stationary, so that rotational symmetry cannot be provided. Moreover the specification does not teach that the pressing by the mold takes place while the structure is rotated, which is practically not possible since the forces would then tear the weak and wet bottom part. While it is possible that the mould 29 would

smooth the outer surface of the bottom part, remains of the wrinkles would still be visible and detectable in the varying thickness bottom part of the separator.

In summary, the lateral inward bending of the portion 22c cannot create rotational symmetry around the separator axis and thus a uniform and even bend about a circumferential section of the cylindrical separator body or a uniform thickness as required by claim 17. A force applied from above by the mould 29 after the lateral bending cannot restore circular symmetry, and the sheet will be bent inwardly so that in each angular position the bending will have different consequences. This results in a basic structural difference between the separator of Yamashita et al and the separator according to the present invention where the bottom is uniform in thickness and in the number of turns at each angular position. Accordingly, for the above stated reasons, it is submitted that claim 17 and claim 18 dependent thereon are allowable over the Yamashita et al patent under 35 U.S.C. 102 and 103.

Reconsideration of the rejection of claims 2 and 4 under 35 U.S.C. 103(a) as being unpatentable over Yamashita et al in view of Haruhisa et al and Gozdz et al is requested. Initially, it is pointed out that each of these claims is dependent on claim 17 and is therefore allowable over the Yamashita et al patent for at least the same reasons as claim 17. The two secondary references were cited simply to show that it is known in the art that binders or adhesives between the wound layers need not be used, but do not overcome the deficiencies of the Yamashita et al reference as discussed above. Additionally, it is submitted that the process of forming the separator of Yamashita et al requires a binder in order to function. In any case, it is submitted that claims 2 and 4 are allowable over the cited combination of references for at least the same reasons as claim 17.

Reconsideration of the rejection of claim 3 under 35 U.S.C. 103(a) as being unpatentable over Yamashita et al in view of Haruhisa et al and Devitt is respectfully requested. Claim 3 is dependent on claim 2, and thus is allowable over the combination of the Yamashita et al and Haruhisa et al patents for at least the same reasons as claim 2. The Devitt patent simply shows that use of the specific materials recited in claim 3 are known in the art but does not overcome the basic deficiencies of the combination of the Yamashita et al and Haruhisa et al patents as discussed above. Accordingly, it is submitted that claim 3 is allowable over the cited combination of references for at least the same reasons as claims 17 and 2.

Finally, reconsideration of the rejection of claim 5 under 35 U.S.C. 103(a) as being unpatentable over Yamashita et al in view of Tomantschger et al is respectfully requested. The Tomantschger et al patent is cited simply to show the use of a thermoplastic sealant at the center of the outer surface of the bottom part of the separator, but does not overcome the deficiencies of the Yamashita et al reference as discussed above with regard to claim 17 from which claim 5 depends. Accordingly, it is submitted that claim 5 is allowable over the cited combination of references for at least the same reasons as claim 17.

In view of the above amendments and for the above stated reasons, it is submitted that each of claims 2-5, 17 and 18 is allowable over the prior art of record and is in condition for allowance. Such action and the passing of this application to issue therefore are respectfully requested.

If the Examiner is of the opinion that the prosecution of this application would be advanced by a personal interview, the Examiner is invited to telephone undersigned counsel to arrange for such an interview.

Respectfully submitted,

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